EVALUATION OF ALLEGED NEXUS OF AMERICAN MODERN METALS CORP. (AMMCo) PROPERTY TO THE LOWER PASSAIC RIVER STUDY AREA SUPERFUND SITE

The Kearny Elite Industrial Park Property
25 Belgrove Drive
Kearny, New Jersey

a.k.a.
The American Modern Metals Corporation Property
60 to 65 Passaic Avenue
Kearny, New Jersey

December 15, 2016

Prepared for:

Cole Schotz, P.C.
on behalf of
DiLorenzo Properties Company and the Goldman/Goldman/DiLorenzo Partnership

Prepared by:

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APPENDICES

1.0 INTRODUCTION

Roux Associates, Inc. (Roux Associates) was retained by Cole Schotz, P.C. on behalf of the DiLorenzo Properties Company and the Goldman/Goldman/DiLorenzo Partnership, to review project documents, conduct technical evaluations, and prepare a report evaluating alleged discharges of hazardous substances from the property located at 44 Passaic Avenue (a/k/a 25 Belgrove Drive) in Kearny, New Jersey to the Passaic River (the "River"). The credentials and professional experience of Dr. Neil M. Ram and Ms. Catherine Boston, who prepared this report, are provided in **Appendix A**.

This property is located east of Passaic Avenue in the vicinity of Marshall Street and Belgrove Drive, Kearny, Hudson County, New Jersey. This property is identified as Block 14, Lots 3 and 4 (the "KIA Parcel") on the tax map of Kearny, New Jersey.[1] American Modern Metals Corp. ("AMMCo") operated at this location from approximately 1959 through the mid-2000s as well as at the property located west of Passaic Avenue (identified as Block 1, Lots 9, 10[2] (the "S&A Parcel"). This evaluation therefore also includes the S&A Parcel. The KIA Parcel and S&A Parcel will together be referred to as the "AMMCo Property" or the "Property" (See Figure which follows which includes buildings that were formerly present on the Property).[3]

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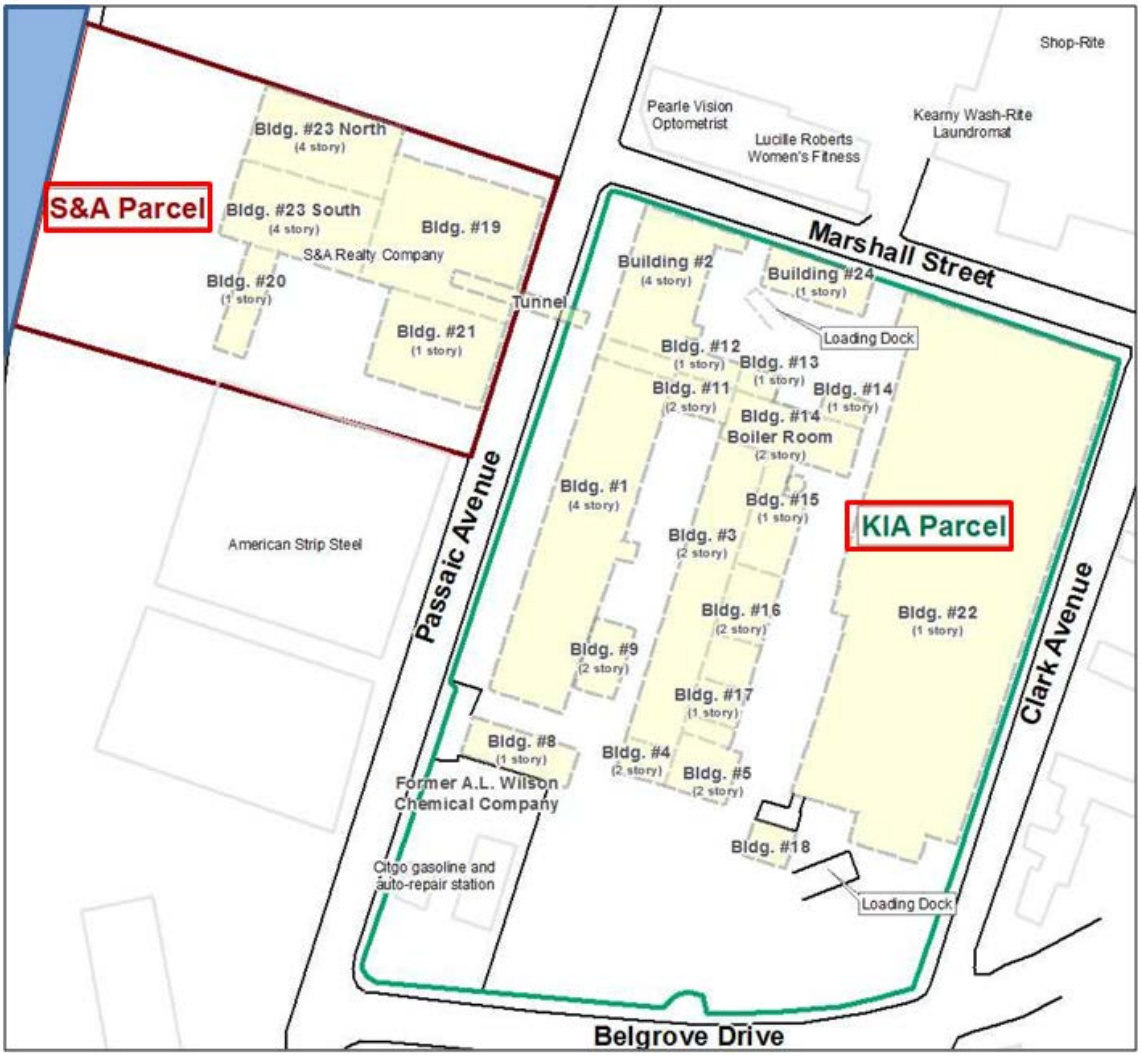
1 Alternate Property addresses include 44 Passaic Ave. and 50 Passaic Ave., as listed in Environmental Data Resource's June 11, 2013 City Directory Abstract Report.

2 It Roux Associates' understanding that Lot 10 has been owned by Conrail or its predecessors since 1926. Tax Assessment Records Search: http://tax1.co.monmouth.nj.us/cgi-bin/m4.cgi?district=0907&l02=090700001____00010_____M&hist=1

3 Note that Buildings #6, #7 and #10 were not identified in project documents.



Property Plan

1.1 Work Performed

To accomplish this evaluation, Roux Associates reviewed various project documents as well as scientific literature and NJDEP guidance documents (cited as footnotes throughout this report). This review included work plans, environmental reports, data, and figures prepared by the entities listed in the following table:

Entity	Date Range
Interstate Services Co. (ISCO)	1989
Law Environmental, Inc. (Law)	1989
Killam Associates (Killam)	1990 - 1991
Bell Environmental Consultants (Bell)	1993 - 2002
Friedman & Bruya, Inc. (Friedman & Bruya) as a subcontractor to Bell	1994
TRC Raviv Associates, Inc. (TRC/Raviv)[4]	1999
Applied Earth Solutions, Inc.	2005 - 2006
TRC Solutions and TRC Environmental Corporation (TRC)	2007 - 2011
Arcadis U.S. Inc. (Arcadis)	2012 - 2015
Roux Associates, Inc. WCD Group	2013 2015-2016

[4] In 1999, Dan Raviv Associates, Inc. was hired to conduct a 3rd party review of the work proposed by Bell. In 2006, TRC Raviv submitted a Baseline Ecological Evaluation Report to NJDEP (it is unclear if/when Dan Raviv was bought by TRC). In 2007, TRC Environmental Corporation (aka TRC Solutions) began work at the Property as a consultant to GGD.

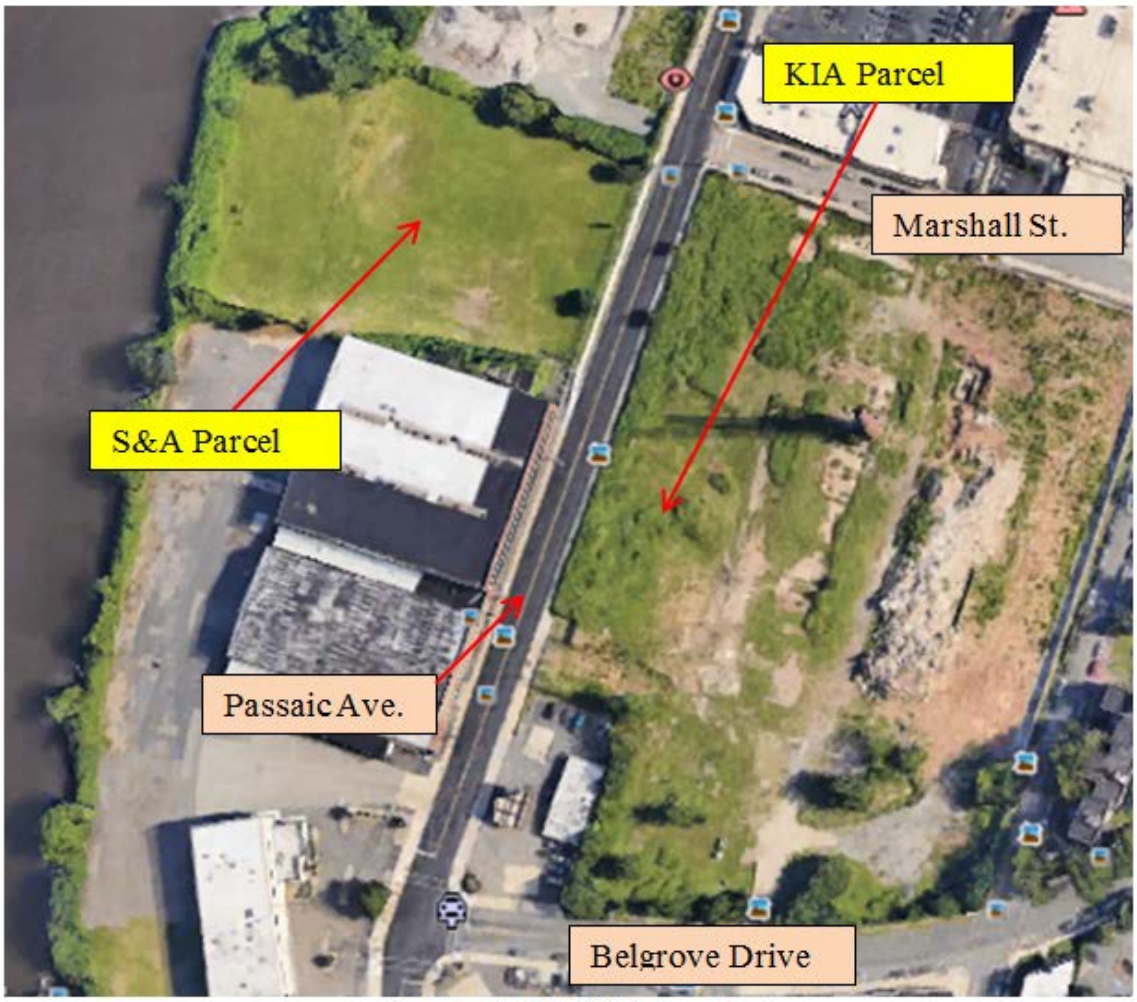
2.0 FACTUAL BACKGROUND

From the late 1800s until 1959, the Property was used by the Marshall Linen & Thread Company for the manufacturing of linen thread, material and yarn from raw flax and twine, and sacks from raw hemp and jute.[5,6] York Associates, Inc. ("York") purchased the Property in 1959 and leased the entire Property to a master lessee associated with Michael Palin,[7] who subleased the Property to various industrial/commercial subtenants, the largest of which was AMMCo, which manufactured aluminum baseball bats and antennae. York transferred the Property to a partnership known as Goldlex in 1963, which continued to master-lease the Property to Palin's entity. More than 20 years later, in 1980, AMMCo became the direct master lessee. In May of 1986, an explosion and ensuing fire destroyed a number of buildings on the western half of the KIA Parcel. Figures depicting the Property before and after the May 1986 explosion, along with current conditions are depicted below.

5 "History of the Town of Kearny," Town of Kearny web site: http:kearnyusa.com/History.
6 "Marshall & Co., Linen Thread & Twines" is depicted in 1907 and 1950 Sanborn maps.
7 The master lessee was initially Elite Industrial Park, Inc., which was succeeded as master lessee by a related company now known as Palin Enterprises. Michael Palin controlled both entities.

1979 Aerial Photograph (all buildings are present in this photo)

1987 Aerial Photograph
(Buildings #6, #8, #9, #19, #20, #21, #22, #23 and #24 present)



Current (2014) Property

In 1988, requirements under the New Jersey Environmental Cleanup Responsibility Act (ECRA), the predecessor to the Industrial Site Recovery Act (ISRA), were triggered when ownership of the Property was transferred from Goldlex to DiLorenzo Properties Company (DPC),[8] and various environmental investigations and response actions at the Property began under New Jersey Department of Environmental Protection (NJDEP) oversight. Investigation and remediation activities at the Property are ongoing. In 1992, DPC transferred ownership of the Property to Kearny Industrial Associates ("KIA"), an affiliate of AMMCo. KIA transferred the western portion of the Property – the S&A Parcel – to S&A Realty Corp. in 2001.

[8] Bell Environmental, 1999. RIR and RIW. November 1999.

2.1 Property Operations

From approximately 1959 until 2004, AMMCo manufactured aluminum products, baseball bats and aluminum antennae, at the Property. AMMCo primarily used few raw materials in its operations: (i) aluminum,[9] (ii) chlorinated solvents,[10] (iii) petroleum solvents (MEK, mineral spirits),[11] and (iv) lubricating[12] and cutting oils.[13] AMMCo's process involved melting aluminum billets, which were then placed in molds to create a "blank" bat.[14] The blanks were then finished by another tenant operating at the Property, Marshall Clark Manufacturing.

Any waste generated by AMMCo's operations was either recycled or sent off-site for disposal. AMMCo operated a "closed loop system"[15] that reused process wastewater as cooling water (meaning AMMCo did not discharge process wastewater to the PVSC system). Lubricating oil was applied to aluminum parts while they were drawn, then when the drawing was complete, the aluminum parts were dipped into a "bath of solvents"[16] to remove the oil.[17] The waste oil/solvent mixture was then processed onsite using a distillation system, and the recycled fluids were reused in operations.[18] Finally, still bottoms containing aluminum fines generated by the manufacturing process were sent to an aluminum recycler.[19] AMMCo's operations were designed to minimize waste generation and discharge of that waste to the environment.

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9 NJDEP, 1984. NJDEP Division of Waste Management Bureau of field Operations Enforcement Referral. March 7, 1984.

10 NJDEP, 1984. NJDEP Inspection Form. March 6, 1984.

11 Undated table entitled "Table A-1-Chemical Inventory for Tenants on the Kearny Facility".

12 Killiam Associates, 1991. Results of Phase II Sampling Plan. August 1991.

13 Killiam Associates, 1991. Results of Phase II Sampling Plan. August 1991.

14 Bell Environmental, 1999. Remedial Investigation Report and Remedial Investigation Workplan. November 1991.

15 New Jersey Department of Environmental Protection Division of Hazardous Waste Management, August 16, 1988 Hazardous Waste Inspection Report.

16 The NJDEP 1988 Inspection Report does not specify the composition of the "bath of solvents" and therefore this potentially consisted of petroleum-based solvents.

17 New Jersey Department of Environmental Protection Division of Hazardous Waste Management, August 16, 1988 Hazardous Waste Inspection Report.

18 New Jersey Department of Environmental Protection Division of Hazardous Waste Management, August 16, 1988 Hazardous Waste Inspection Report.

19 Dec. 29, 1986 NJDEP Memorandum regarding American Modern Metals/Airlite Aluminum.

Chemicals used by AMMCo included:

(a) Mineral spirits and lube oils;[20]

(b) Spent halogenated solvents, waste oils, lacquer thinner;[21]

(c) Petroleum-based solvents, including Cyclo-Sol 53;[22]

(d) Petroleum hydrocarbons; naphthenic distillate; toluene; xylenes; methyl ethyl ketone (MEK); methanol; n-butyl acetate; Methylene Chloride (MeCl);

(e) Aluminum alloys (with other metals);[23]

(f) No. 4 and No. 6 fuel oil;[24,25]

(g) Mineral spirits;[26]

(h) Leaded gasoline;[27] and

(i) Various cutting oils;[28] and

(j) Polyurethane foam.[29]

Chemicals used by Marshall Clark Manufacturing (which affixed the rubber handles and painted the bats manufactured by AMMCo) used the following chemicals:

(a) Mineral spirits, lacquer and lacquer thinner;[30]

(b) Methylene diphenyl isocyanate; surfactants; amine catalysis; epichlorohydrin;[31]

(c) Paints and solvents;[32] and

(d) Foams, paints, inks, lacquers, glues, buffing compounds, solvents etc.[33]

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20 AMMCo, 1986. AMMCo letter to NJDEP re: Tenants and Materials. June 19, 1986.
21 NJDEP, 1984. NJDEP Inspection Form. March 6, 1984.
22 NJDEP, 1984. NJDEP Division of Waste Management Bureau of Field Operations Enforcement Referral. March 7, 1984.
23 Undated table entitled "Table A-1-Chemical Inventory for Tenants on the Kearny Facility".
24 Hand notes entitled "American Modern Metals 6/8/88."
25 TRC Environmental, 2011. TRC Preliminary Assessment/Phase I Environmental Site Assessment Report. May 4, 2011.
26 Hand notes entitled "American Modern Metals 6/8/88."
27 Hand notes entitled "American Modern Metals 6/8/88."
28 Killiam Associates, 1991. Results of Phase II Sampling Plan. August 1991.
29 Bell Environmental, 1999. Remedial Investigation Report and Remedial Investigation Workplan. November 1991.
30 AMMCo, 1986. AMMCo letter to NJDEP re: Tenants and Materials. June 19, 1986.
31 NJDEP, 1984. NJDEP Inspection Form. March 6, 1984.
32 Killam, 1990. Results of Sampling Plan. June 1990.
33 Killiam Associates, 1991. Results of Phase II Sampling Plan. August 1991.

Note that chemical constituents in the above materials relative to chemicals of concern (COCs) in the River are discussed in **Section 3.2** of this report.

2.2 Alleged Nexus to the Lower Passaic River

In February of 2004, the USEPA sent a Request for Information (RFI)[34] to AMMCo in reference to the Lower Passaic River Study area. In April of 2004, AMMCo responded to USEPA's RFI,[35] and provided the following documents (hereinafter referred to as the "2004 AMMCo Documents"):

1. Material Safety Data Sheets for Varsol 1, hydraulic oil, and lubricants;
2. Two letters dated October 30, 2003 and November 7, 2003 from Bressler Amery & Ross P.C. regarding the NJDEPs Lower Passaic River Directive;
3. Bell Environmental's November 1999 Remedial Investigation Report and Remedial Investigation Work plan for the AMMCo Property;
4. Bell Environmental's July 2001 Remedial Investigation Report for the AMMCo Property;
5. Bell Environmental's May 2002 Groundwater Remedial Investigation Report Addendum #2 for the AMMCo Property;
6. Applied Earth Solutions May 7, 2003 letter to the NJDEP re: American Modern Metals Corp.;
7. Bell Environmental's September 1995 Draft Remedial Investigation Report/Remedial Action work plan for the AMMCo Property; and
8. Various General Information Submissions and Site Evaluation Submissions forms for prior tenants of the Property.

[34] USEPA, 2004. Letter from USEPA to American Modern Metals Corporation Re: Lower Passaic River Study Area Request for Information Pursuant to 42 U.S.C. 9601-9675 (960100001). February 23, 2004.

[35] Riker Danzig Scherer Hyland Perretti, 2004. Letter from Riker Danzig Scherer Hyland Perretti to USEPA re: Information Request American Modern Metals Company. April 2, 2004.

Following the April 2004 submission, USEPA sent General Notice Letters to AMMCo on June 6, 2004, S&A Realty Corp. on August 13, 2004, and DPC on September 24, 2004,[36] notifying these parties of their potential liability for response actions in the Lower Passaic River Study Area (LPRSA). The General Notice Letter sent to AMMCo[37] alleges the following for the KIA Parcel:

> "Based on information that EPA evaluated during the course of its investigation of the Site, EPA believes that hazardous substances were being released from American Modern Metals' facility located at 44 Passaic Avenue (a/k/a 25 Belgrove Drive) in Kearny, New Jersey, into the Lower Passaic River Study Area."

It is appears that the "information that EPA evaluated" noted in USEPA's General Notice Letters are the eight categories of documents listed above which AMMCo provided to USEPA in response to USEPA's RFI. However, none of the eight documents identifies any discharges or specifies the basis for USEPA's assertion that hazardous substances had been released from the AMMCo Property to the Passaic River.[38]

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[36] Note that the USEPA did not send a general information request to DiLorenzo Properties, only the September 24, 2004 general notice letter.

[37] USEPA, 2004. USEPA letter to American Modern Metals Company. General Notice Letter: Diamond Alkali Superfund Site Notice of Potential Liability for Response Actions in the Lower Passaic River Study Area, New Jersey.

[38] The General Notice Letters refer to "44 Passaic Avenue (a/k/a 25 Belgrove Drive)." That was the address only for the KIA Parcel, not the S&A Parcel. This letter nonetheless addresses the entire AMMCo Property.

On June 22, 2004, AMMCo responded to USEPA's General Notice Letter,[39] stating that it had filed for chapter 11 bankruptcy protection. Similarly, on June 15, 2005 DPC responded to USEPA's General Notice Letter,[40] on behalf of itself and the Goldman/Goldman/DiLorenzo Partnership (f/k/a Goldlex), stating, among other things, its intention to join the Cooperating Parties Group ("CPG").

In response to a subsequent FOIA request, USEPA provided the documents listed below (hereinafter referred to as the "2016 USEPA FOIA Documents"):[41]

1. Notice of Potential Liability for Response Actions in the Lower Passaic River Study Area, Submitted to DiLorenzo Properties Co. (with attachment);
2. Letter RE: Settlement Agreement and Response Costs for Settling Parties, Lower Passaic River Study Area, Goldman/Dilorenzo Companies;
3. Letter RE: Notice of Potential Liability for Response Actions in the Lower Passaic River Study Area, Submitted to American Modern Metals Corp.;
4. Response to the Request for Information Submitted to American Modern Metals Corp., Passaic River Study Area (with attachments);
5. Letter RE: Response to the Notice of Potential Liability in the Lower Passaic River Study Area, Submitted to American Modern Metals Corp.;
6. Letter RE: Information Request, American Modern Metals Corp. (AMMCo);
7. Letter RE: Request for Information Submitted to American Modern Metals Corp., Lower Passaic River Study Area (with attachment);
8. Letter RE: Notice of Potential Liability for Response Actions in the Lower Passaic River Study Area, Submitted to Dilorenzo Properties Co. (with attachment);
9. Letter RE: Settlement Agreement and Response Costs for Settling Parties, Lower Passaic River Study Area, Goldman/Dilorenzo Related Companies.

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[39] Ravin Greenberg PC., 2004. Ravin Greenberg to USEPA RE: American Modern Metals Corp. Case No. 03-26555/DHS. June 22, 2004.

[40] Waters, McPherson, McNeill, 2005. Letter from Waters McPherson McNeill to USEPA re: In the Matter of the Lower Passaic River Study Area Portion of the Diamond Alkali Superfund Site Agreement Under Section 122(h) of CERCLA: USEPA Region 2; Spill Site ID Number 02-96 CERCLA Docket No. 02-2004-2011 Our File: 5778-035. June 15, 2005.

[41] The FOIA request (EPA-R2-2015-010444) specified "inventory of records from the Diamond Alkali Superfund Site file regarding DiLorenzo Properties Company and the facility located at 44 Passaic Avenue (aka 25 Belgrove Drive), Kearny, New Jersey."

Like the 2004 AMMCo Documents, the 2016 USEPA FOIA Documents fail to identify any discharges from the Property to the River and provide no basis for USEPA's assertion that hazardous substances had been released from the AMMCo Property to the River. The 2016 USEPA FOIA documents contained the same technical materials that were provided in the 2004 AMMCo Documents. Roux Associates has reviewed the 2004 AMMCo Documents and the 2016 USEPA FOIA Documents in an attempt to determine USEPA's basis for identifying Goldman/DiLorenzo as a PRP. Based on that review, Roux Associates has identified the following information that USEPA apparently relied upon when it issued the June 6, 2004 and September 24, 2004 General Notice Letters to AMMCo and DPC:

1. The presence of a drain at the loading dock formerly located on the S&A Parcel that discharged to the Passaic River;
2. The presence of hazardous substances in AMMCo Property soils; and
3. Groundwater flow direction from the AMMCo Property.

As discussed more fully below, none of these facts support a conclusion that hazardous substances were released from the AMMCo Property into the Passaic River based on the following lines of evidence:

1. Data collected from the AMMCo Property indicates that no COCs in the Passaic River, and indeed no hazardous substances at all, were discharged from the S&A Parcel loading dock drain to the Passaic River (See **Section 3.1**);
2. Contaminants of concern (COCs) in the Passaic River, namely 2,3,7,8-tetrachlorodibenzo-p-dioxin, polychlorinated biphenyls (PCBs), mercury, dichlorodiphenyltrichloroehtane (DDT), copper, lead, polycyclic aromatic hydocarbons ("PAHs"), and dieldrin, are not attributable to Property soils or Property operations (See **Section 3.2**); and
3. COCs in the Passaic River are not attributable to hazardous substances identified in groundwater at the Property (See **Section 3.3**).

In addition to the items above, although neither the 2004 AMMCo Documents nor 2016 USEPA FOIA Documents discuss the potential for hazardous substances from the Property to be transported to the River, the facts do not support a conclusion that hazardous substances from the AMMCo Property migrated to the Passaic River because:

4. The Property had no industrial sewer and used a closed loop system; there is no evidence that hazardous substances were dumped into the Passaic River from the AMMCo Property (See **Section 3.4**).

5. The only potential pathway for PAHs or metals to have reached the River is from occassional stormwater discharges carrying suspended soils (typically refereed to as total suspended solids or "TSS") from the property. However (a) there is nothing in the project record indicating that hazardous substances were discharged in stormwater from the Property, (b) even assuming, despite the lack of data, that PAH and metal impacted soil discharged to the River via stormwater, these hazardous substances would be attributable to historic fill that is ubiquitous on the S&A parcel and partially present on the KIA parcel, and (c) there are no data to support a conclusion that any PAH or metals-impacted TSS soils were carried in stormwater originating from the KIA parcel (See **Section 3.5**).

Each of the five lines of evidence above is discussed in detail in the sections that follow.

3.0 DISCUSSION

This section provides a detailed discussion to support the conclusion that hazardous substances associated with operations at the AMMCo Property were not released into the Passaic River.

3.1 Data Collected from the AMMCo Property Evidences that No Hazardous Substances were Discharged from the S&A Parcel Loading Dock Drain to the Passaic River

Project documents provided to USEPA by AMMCo identify a drain located on the S&A Parcel at a loading Dock to the Marshall Clark Building (Building 21). The drain was sealed sometime prior to 1993.[42] Bell Environmental's 1995 Draft RIR states that "*NJDEP required that AMMCo determine the discharge point of the drain located in this area. According to AMMCo personnel, this drain formerly discharged to the Passaic River. AMMCo has sealed the drain…Because the drain is no longer in use and has been sealed, AMMCo proposes no further action relative to this area*." There is no documented discharge of hazardous materials in the vicinity of this loading dock other than the PAHs associated with historical fill at the Property. Specifically, PAHs in sample locations PE-56 through PE-60 collected in the vicinity of the loading dock at the Marshall Clark Building (Building #21) contained elevated concentrations of PAHs to a depth of 3-feet bgs (see Figure which follows).[43,44] Bell Environmental concluded that elevated concentrations of PAHs in the vicinity of the loading dock were attributable to historical fill emplaced at the Property prior to 1900.[45]

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[42] Bell Environmental, October 15, 1993. Letter from Bell to NJDEP re: September 1993 cleanup plan progress report.
[43] Bell Environmental, 1995. Draft Remedial Investigation Report/Remedial Action Workplan. September 29, 1995.
[44] Bgs = below ground surface.
[45] Bell Environmental, 1995. Draft Remedial Investigation Report/Remedial Action Workplan. September 29, 1995. (Sections 3.2.10 and Section 4.8.1).

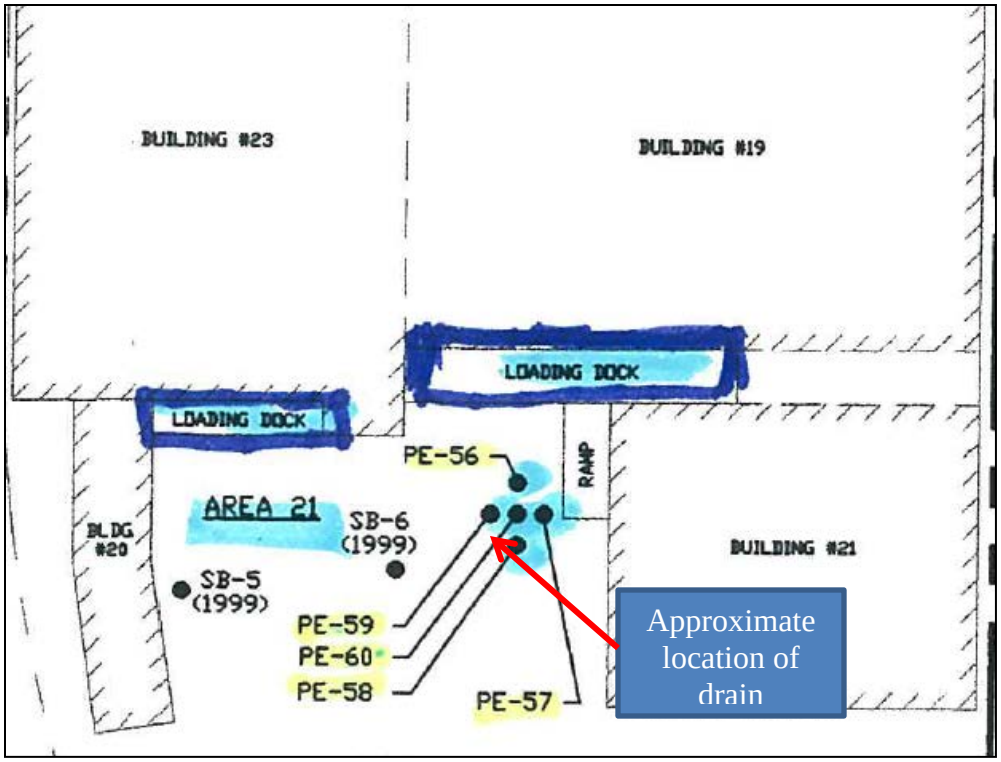

Figure from Bell Environmental Report Depicting Surface Soil Sample Locations[46]

There is no information or data indicating that the former drain structure on the S&A Parcel provided a pathway for any COCs – or, in fact, any hazardous substances – on the AMMCo Property to be transported to the Passaic River. As noted above, no hazardous substances attributable to operations onsite were detected in soil samples collected in the immediate vicinity of the loading dock.[47] If the former drain structure had provided a pathway for hazardous substances to discharge to the River, one would expect to detect those substances in the immediate surrounding soil. Thus, these data indicate that no hazardous substances (other than, potentially, PAHs from historical fill) would have been discharged into the loading dock drain leading to the River.

Further, the loading dock drain was the only piping conveyance at the Property with a direct connection to the River. A 1988 NJDEP inspection, states that, "AMM [i.e. AMMCo] said

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[46] Bell Environmental. Analytical Results for Post Excavation Soil Samples Exceeding NJDEP Residential Soil Cleanup Criteria Exhibit B—Figure 1. Note that drain location is approximate based upon proximity to soil borings; project documents do not depict actual drain location.

[47] Polyaromatic hydrocarbons (PAHs) which are associated with historic fill, were detected in soils around the loading dock. Bell Environmental also concluded that elevated concentrations of PAHs in the vicinity of the loading dock were attributable to historical fill emplaced at the property prior to 1900 [Bell Environmental, 1995. Draft Remedial Investigation Report/Remedial Action Workplan. September 29, 1995. (Sections 3.2.10 and Section 4.8.1)].

that they did not discharge any process wastewater from their Property. They use trace cooling water; this is a closed loop system."[48] Therefore, not only were no hazardous substances discharged to the River via the loading dock drain, no hazardous substances would have been discharged directly to the River via because no such other conveyances existed at the Property and AMMCo's operations did not result in industrial wastewater that required discharge.

3.2 COCs in the Passaic River are Not Attributable to Property Soils or Operations

As presented earlier, AMMCo and Marshall Clark Manufacturing used a variety of materials (such as petroleum distillates, methylene choride, MEK, spent halogenated solvents[49] and aluminum) in their manufacturing and assembly operations at the Property. Roux Associates evaluated soil data collected from the Property as reported in the 2004 AMMCo and 2016 USEPA FOIA documents to determine whether specific chemicals that may have been associated with AMMCo or Marshall Clark Manufacturing activities were released to the environment by first identifying chemicals detected in the upper 6 inches of soils[50] collected from the Property,[51] and then comparing these concentrations to USEPA's residential soil regional screening levels (RSLs).[52] Roux Associates then identified those chemicals detected above RSLs on the Property which are also COCs for the Passaic River.[53] Based on this comparison, Roux determined that PAHs (Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-c,d)pyrene, Naphthalene and Pyrene, metals (lead and copper), and polychlorinated biphenyls (PCBs) (Aroclor 1254 and 1260) detected in the top 6-inches of soil on the Property exceeded RSLs and are also COCs for the River. Roux then compared these concentrations with

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48 New Jersey Department of Environmental Protection Division of Hazardous Waste Management, August 16, 1998. Hazardous Waste Inspection Report.

49 The NJDEP March 6, 1984 Inspection Form indicated that F001 wastes were located on the Property. Halogenated solvents include chlorinated solvents.

50 Surface soils are typically considered to be the top 6 inches of soil to quantify potential exposures in health risk assessments. State Water Resources Control Board, "Technical Justification for Soil Screening Levels for Direct Contact and Outdoor Air Exposure Pathways," March 15, 2012.

51 Roux Associates' evaluation of soil data at the Property is based upon data collected through October of 2013.

52 USEPA's residential RSLs were selected to evaluate potential soil impacts at the Property, as residential standards are the most protective of human health, and therefore, are the most conservative.

53 USEPA's 2016 ROD describes COCs at page 23 as "Those COPCs identified in the HHRA [Human Health Risk Assessment] as posing the greatest risk are referred to as COCs, and are the primary focus of the response action proposed in this ROD" (COPCs are chemicals of potential concern). COCs for the River were provided in Table 1 of the USEPA 2016 ROD, "Contaminants of Concern in Surface Sediment."

those typically present in historic fill material in New Jersey (**Table 1**).[54,55] Based on this comparison, Roux Associates determined that, with the exception of two sample locations, none of the PAHs or metals exceeded concentrations typically observed in historic fill. Additionally, as discussed below, PAHs at these two locations are not associated with operations at the Property.

Roux Associates has also concluded that PAHs, PCBs or metals (lead and copper) present in the River are not attributable to operations at the Property as discussed in **Section 3.2.1**, **Section 3.2.2** and **Section 3.3.3**, respectively. Further, although two insecticides (dieldrin and DDT) and one metal (mercury) were detected in soil samples collected at the Property at concentrations below USEPA RSLs, Roux Associates also evaluated their potential nexus to the River and has concluded that dieldrin, DDT and mercury in the River are also not attributable to operations at the Property (**Section 3.2.4** and **Section 3.2.5)**.

3.2.1 PAHs

Historic fill is present at the Property. Fill material was used to raise the topographic profile of the Property sometime between 1840 and 1883,[56] when the Marshall Flax Spinning Company was erected at the Property. The state of New Jersey notes that "Historic fill material is likely to contain contaminants including PAHs and metals at levels in excess of the Department's applicable soil remediation standards."[57].

As presented earlier, AMMCo used various petroleum products in their operations. Soil staining has been observed in several areas on the S&A parcel and light non aqueous phase liquid (LNAPL) petroleum product were identified in several groundwater monitoring wells located on the KIA parcel, located east of Passaic Avenue (see figure that follows).

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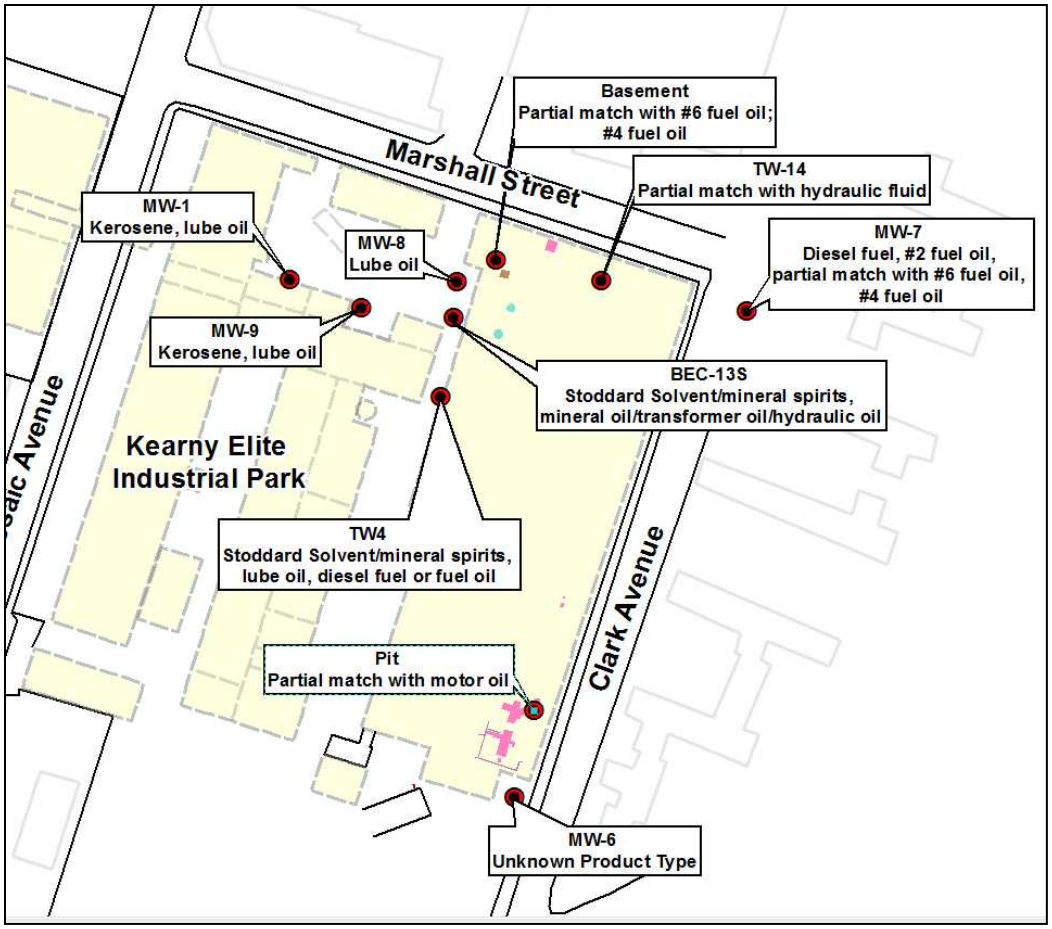
54 N.J.A.C 7:26E Technical Requirements for Remediation. Appendix D Historic Fill Database Summary Table. October 2011.

55 Roux Associates notes that on April 29, 2013, NJDEP updated its guidance on historic fill material to provide methods to confirm the presence of historic fill material and procedures to delineate such material, including a site specific investigation and historic fill study (NJDEP, "Historic Fill Material Technical Guidance," April 2013, Version 2.0. However, the NJDEP historically provided ranges of contaminant concentration in "*typical historic fill material*" (N.J.A.C. 7:26E N.J.A.C. 7:26E-4.6 Table 4-2). Ranges of typical fill material presented in Table 4-2 are discussed herein for illustrative purposes only, and do not constitute a site specific fill evaluation/determination as is required under current NJDEP regulations.

56 New Jersey Department of Environmental Protection, 2004. Land Use Management New Jersey Geological Survey Historic Fill of the Orange Quadrangle, Historic Fill Map HFM-41.

57 New Jersey Department of Environmental Protection, April 29, 2013. Site Remediation Program: Historic Fill Material Technical Guidance. Page 13.



Non Aqueous Phase Petroleum Observed in Several Monitoring Wells on the KIA Parcel

However, LNAPL has not been observed in any of the monitoring wells to the west of Passaic Avenue, on the S&A parcel, indicating that petroleum product has not migrated across Passaic Avenue and has not reached the Passaic River. Further, with two exceptions, no concentrations of PAHs in soil exceed concentrations typical of historic fill material. Further, it can be concluded that PAH concentrations at the two locations where PAHs did exceed concentrations of historic fill material are not related to operations at the Property:

- PAHs in SB-5, located on the KIA parcel, exceeded concentrations of typical fill. However the geologic description for the sample noted "Misc fill material; Asphalt, brick, stone."[58] Therefore, impacts at this location are related to fill material and not to former operations on the Property.

[58] Killam Associates, 1990. Results of Sampling Plan. June 1990.

- PAHs also exceeded concentrations typical of fill in SB-17, however this sample was collected as a "background sample" from a nearby residence, and therefore was not collected on the Property, or associated with Property operations.[59] This sample confirms fill material in the vicinity of the Property contributes to elevated levels of PAHs.

Further, project documents associated with the Lower Passaic River concluded that PAHs identified in Passaic River sediment are associated with historical coal tar residue; AMMCo did not conduct operations that produced coal tar.

3.2.2 Metals

Copper and lead were detected in the upper 6-inches of soils at the Property at levels that exceeded USEPA's RSLs as summarized in the table which follows.

Metal	Maximum Concentration	Typical concentrations in historic fill	USEPA Residential Soil RSL (mg/kg)	Roux Associates Comments
Copper	5,560 mg/kg	Not provided[60]	310	Although copper exceeded RSLs at 10 locations, copper is not associated with Property operations and is found in historic fill material.
Lead	1,910 mg/kg	10,700 mg/kg[61]	400	Although lead exceeded RSLs, lead is not associated with Property operations and is found in historic fill material.

Therefore, copper and lead exceeding RSLs in the upper 6-inches of soils at the Property are attributable to historical fill that was emplaced at the Property sometime between 1840[62] and 1883 when the Marshall Flax Spinning Company was erected at the Property. Furthermore, there is no evidence of copper or lead usage at the Property during the period of AMMCo's operations.

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59 Bell Environmental, 1995. Draft Remedial Investigation Report/Remedial Action Workplan. September 29, 1995. Section 4, page 14.

60 The NJDEP did not specify ranges for copper.

61 The NJDEP historically provided ranges of contaminant concentrations in "typical historic fill material" (N.J.A.C. 7:26E N.J.A.C. 7:26E-4.6 Table 4-2). For lead, NJDEP specified a maximum concentration of 10,700 mg/kg typical of historic fill, which is higher than the 1,910 mg/kg detected at the property.

62 New Jersey Department of Environmental Protection, 2004. Land Use Management New Jersey Geological Survey Historic Fill of the Orange Quadrangle, Historic Fill Map HFM-41.

3.2.3 PCBs

PCBs (Aroclor 1254 and Aroclor 1260) were detected at the Property in the upper 6-inches of soil exceeding USEPA RSLs at only one isolated location (SB-9D-102),[63] surrounded by soil samples that were non-detect for PCBs. This one location is illustrated in the figure that follows:

Location of Aroclor 1254 and 1260 USEPA RSL Exceedance
(Green values are below USEPA Residential RSLs, red values above)

[63] USEPA Regional Screening Levels for Residential Soil. Summary Table (TR = 1E-06, HQ = 1). June 2015 (revised). Values based on residential exposure.

Although PCBs were not used in AMMCo's operations, PCBs may have been present in an electrical transformer formerly located on the Property.[64] The transformers were located in the northern portion of the facility (six transformers) and also near a loading dock (three transformers) (see figure which follows showing transformer locations and sample location SB-9D-102). As the figure indicates, SB-9D-102 is in close proximity to the northern transformers.

Approximate Locations of Former Transformers on the Property [65]
(Highlighted in yellow)
In Relation to SB-9D-102 and storm sewers
(Note: shadow is from the smoke stack at the center of the photograph)

[64] In 1992, analysis of oil in the transformers at the Property determined that PCBs were not present in dielectric fluids, the transformers were drained, and transformers disposed of (Bell Environmental, 1992. Letter from Bell Environmental to NJDEP re: American Modern Metals Company).

[65] Based on transformer locations provided in Law Environmental's May 1989. Kearney ECRA Sampling Plan-Proposed Sampling Locations & Areas of Environmental Concern.

Following the detection of PCBs at SD-9D-102, approximately 10 cubic yards of soil were excavated in December 1992[66] in the vicinity of the transformer pad,[67] after which confirmatory samples were collected. No PCB impacts were detected. This post-excavation sampling confirmed the limited extent of PCB impacts in the area of the former northern transformer.[68] No additional excavation was necessary, and No Further Action (NFA) determination was granted by NJDEP on June 15, 1992.[69] Because the PCB impacts were localized, fully delineated, and not proximate to any of the storm sewers located in Passaic Ave., there is no evidence that PCBs migrated from the Property to the Passaic River.

3.2.4 Dieldrin and DDT

Dieldrin and DDT, which are COCs for the River, were detected in soil samples collected at the Property but at concentrations below USEPA RSLs. Dieldrin was detected in one soil sample at a level of 0.0184 mg/kg, and DDT was detected in two samples at a maximum concentration of 0.0291 mg/kg (dieldrin and DDT were detected in SB-9D-102, near the former transformer as discussed in the PCB section above, and DDT was also detected at SB-9D102 in the southern, interior portion of the Property).

Both Dieldrin and DDT were historically used very broadly in the state of New Jersey. DDT was used for mosquito control programs, and Dieldrin was ubiquitously used for the control of insects. Therefore, the presence of these contaminants in urban environments (like Kearny) is widespread. Based on values provided in NJDEP guidance from 1993,[70] the levels present at the Property are well below the range of what would be considered "background." There is no evidence that the presence of any of these chemicals can be attributed to an on-site discharge. See summary table below that follows.

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66 October 15, 1992. Bell Environmental Letter to NJDEP re: Cleanup Plan Progress Report for September 1992.
67 January 15, 1992. Letter from Bell Environmental Consults to the NJDEP re: December 1992 Cleanup Plan Progress Report.
68 February 28, 1996. NJDEP Letter to Waters, McPherson, McNeill and American Modern Metals.
69 June 15, 1992. NJDEP Letter to Waters, McPherson, McNeill re: Approval of Clean-up Plan.
70 NJDEP, 1993. A Summary of Selected Soil Constituents and Contaminants at Background Locations in New Jersey. NJDEP Site Remediation Program and Division of Science & Research.

Summary of Pesticides Detected at the Property vs. NJDEP Background		
Compound	**Property Concentration**	**NJDEP Background Value (arithmetic mean)**[71]
Dieldrin	0.0184 mg/kg	0.0333 mg/kg
DDT	0.0291 mg/kg[72]	0.0789 mg/kg[73]

3.2.5 Mercury

Mercury, which is COC for the River, was detected in several soil samples collected at the Property, but at concentrations below USEPA RSLs. The maximum concentration of mercury detected at the Property was 0.82 mg/kg, which is about half of the maximum mercury concentration (equal to 1.58 mg/kg[74]) reported in two NJDEP studies on background concentrations of metals in New Jersey soils.[75,76] Further, the average mercury concentration in samples where mercury was detected is equal to 0.28 mg/kg, which is less than half the USEPA RSL of 1.1 mg/kg. No operations at the Property utilized mercury. These data indicate that mercury is not attributable to Property operations.

3.3 COCs in the Passaic River are Not Attributable to Hazardous Substances Identified in Groundwater at the Property

As presented earlier LNAPL consisting of petroleum constituents, which include PAHs, have been detected in groundwater on the KIA parcel. Given that some figures contained in the 2004 AMMCo and 2016 USEPA FOIA documents depict overburden groundwater flowing to the west/northwest (i.e. towards the Passaic River), USEPA may have concluded that petroleum, including PAHs, dissolved in groundwater were discharging to the Passaic River. However as discussed below, there is no evidence that PAHs in groundwater discharged to the River.

As discussed previously and based on documents reviewed, LNAPL has only ever been detected in wells located on the KIA parcel; it has never been observed in any of the

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71 NJDEP, 1993. A Summary of Selected Soil Constituents and Contaminants at Background Locations in New Jersey. NJDEP Site Remediation Program and Division of Science & Research.

72 4,4'-DDT.

73 Maximum background value for o,p'-DDT (0.632 mg/kg) and p,p'-DDT (0.0789 mg/kg).

74 The 1993 NJDEP study reported 1.58 mg/kg as the 90th percentile value for background samples analyzed for mercury. The 2003 NJDEP study notes that mercury in a few samples exceeded 1.0 mg/kg.

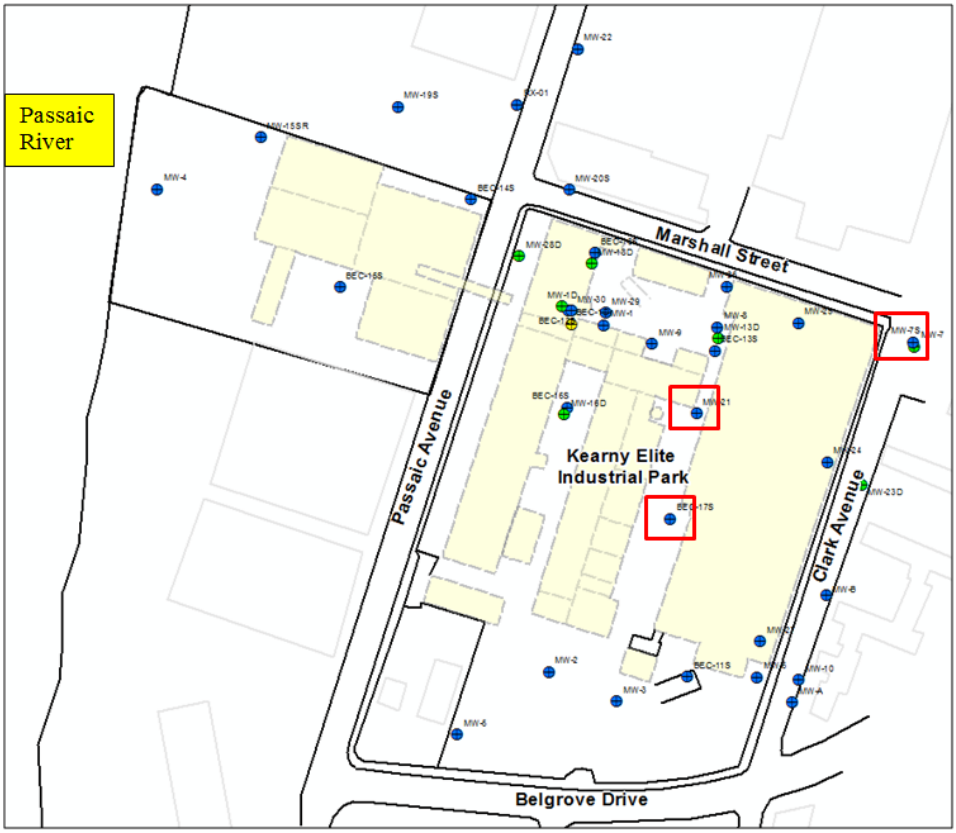
75 NJDEP, 2003. Sanders, P.F. Environmental Assessment and Risk Analysis Element: Research Project Summary: Ambient Levels of Metals in New Jersey Soils. Table 1. Ambient Concentration of Extractable Metals Measured in 248 New Jersey Soil Samples. http://www.nj.gov/dep/dsr/research/ambient-levels-metal.pdf

76 NJDEP, 1993, "A Summary of Selected Soil Constituents and Contaminants at Background Locations in New Jersey, NJDEP Site Remediation Program and Division of Science & Research.

monitoring wells located on the S&A parcel. It can further be concluded that LNAPL (and associated PAHs) did not reach the River via groundwater migration because LNAPL has only been detected sporadically in individual wells on the eastern side of Passaic Avenue (on the KIA parcel) and has exhibited limited mobility:

(a) PAHs were only detected above New Jersey groundwater quality standards in three wells (MW-7S, BEC-17S and MW-21), again all located on the KIA parcel farthest from the River (see figure that follows); and

(b) The three wells in which PAHs above New Jersey groundwater standards were detected (MW-7S, BEC-17S and MW-21) were not sampled using low-flow techniques, and therefore the PAH exceedances are likely related to sediment entrained in the samples.[77]



Location of Wells (MW-7S, BEC-17S and MW-21)
Where PAH concentrations Exceed N.J. Groundwater Standards

Therefore, PAHs in the River are not attributable to hazardous substances identified in groundwater at the Property.

[77] TRC, 2011. Focused Remedial Investigation Report. May 9, 2011. Page 14.

3.4 The Property had no Industrial Sewer, and No Hazardous Substances were Dumped in the Passaic River

USEPA FOIA and 2004 AMMCo Documents contain no evidence of chemical dumping in the River from the AMMCo Property or of any industrial sewer at the Property. Indeed**,** during a 1988 NJDEP inspection, the inspector reported that AMMCo "did not discharge any process wastewater from their Property. They use trace cooling water; this is a closed loop system."[78] Therefore, there could not have been any discharges of wastewater to the River through the sewer system from the Property. Nor is there any evidence that AMMCo dumped any hazardous substances into the Passaic River.

3.5 There is No Data that Stormwater Resulted in the Discharge to the Passaic River of Any Hazardous Substances Associated with Property Operations

USEPA FOIA and 2004 AMMCo Documents contain no data or even suggestion of a nexus from the Property to the River via migration of hazardous substances in Property soils suspended in overland flow discharging into the Passaic Valley Sewerage Commission (PVSC) sewer system. As discussed earlier, moreover, none of the River COCs can be attributed to operations at the Property. As a preliminary matter:

a. The KIA parcel was largely covered with buildings that would have prevented mobilization of soils and entry into the storm sewer system during storm events.

b. Under normal conditions, or during storm events that were not large enough to trigger a bypass event (via an outfall), all stormwater discharged to the storm sewers from the KIA Parcel was directed to the PVSC system. There is no data that any hazardous substances were contained in KIA Parcel stormwater that may have discharged directly to the Passaic River during bypass events.

c. The S&A Parcel was not serviced by storm sewers and was historically covered with a "gravel yard"[79] and therefore such stormwater likely seeped into the ground. According to the NJDEP,[80] gravel is often installed to help promote infiltration and limit stormwater runoff. There is no data of any hazardous substances discharging to the Passaic River via stormwater flow on the S&A Parcel.

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78 New Jersey Department of Environmental Protection Division of Hazardous Waste Management, August 16, 1998. Hazardous Waste Inspection Report

79 Bell Environmental, 2002. Bell Environmental Letter to NJDEP dated November 2002.

80 NJDEP website entitled "Clean Water NJ": http://www.nj.gov/dep/cleanwaternj/faqs.html.

Even if one assumed that stormwater flow discharged to the Passaic River via overland flow from the S&A Parcel,[81] or via overflow events in storm sewers associated with the KIA Parcel, this stormwater would not have contained hazardous substances attributable to operations at the Property. That is because:

a. As discussed earlier, the only hazardous substances associated with the Property above USEPA RSLs that are also COCs for the River are PAHs and metals (copper and lead);

b. There is no data indicating that any of these hazardous substances were carried in stormwater to the River; and

c. Even assuming, despite the lack of data, that PAH and metal impacts discharged to the River via stormwater, these hazardous substances would be attributable to historic fill that is ubiquitous on the S&A parcel and partially present on the KIA parcel and there are no data to support a conclusion that any PAH or metals-impacted TSS soils were carried in stormwater originating from either the S&A or the KIA parcel.

[81] A portion of the S&A Parcel along the shoreline of the Passaic River is within the 100-year floodplain (as designated by the Federal Emergency Management Agency). The KIA Parcel is not within the 100-year floodplain. Therefore, the only materials potentially mobilized in a 100-year flood event would be fill material from a portion of the S&A Parcel. (https://msc.fema.gov/portal/search?AddressQuery=65%20passaic%20ave%20kearny%20nj#searchresultsanchor)

4.0 CONCLUSIONS

Based on a review of the supporting documentation for USEPA's General Notice Letter pertaining to the Property, there is no evidence that any COCs for the Passaic River were discharged by AMMCo's operations at the Property. In particular:

1. Data collected from the AMMCo Property indicates that no hazardous substances were discharged from the S&A Parcel loading dock drain to the Passaic River.

2. COCs in the Passaic River are not attributable to Property soils or operations at the Property.

3. COCs in the Passaic River are not attributable to Property groundwater.

4. The Property had no industrial sewer, and no hazardous substances were dumped in the Passaic River.

5. Even assuming, despite the lack of evidence, that PAH and metal impacts discharged to the River via stormwater, these hazardous substances would be attributable to historic fill that is ubiquitous on the S&A parcel and partially present on the KIA parcel and there are no data to support a conclusion that any PAH or metals-impacted TSS soils were carried in stormwater originating from either the S&A or the KIA parcel.

None of these mechanisms constitute a basis for USEPA to conclude that hazardous substances were released from the AMMCo Property to the Passaic River.

TABLES

Table 1:
Comparison of Chemicals Detected in Property Soil Exceeding RSLs that are COCs for the River, and are Components of Fill
The KIA and S&A Parcels, Kearny, NJ

Item	Compound	Average Concentration (mg/kg)	Historic NJ Fill (mg/kg)	Number of Samples Collected
PAHs	Benzo(a)anthracene	29.9	160	61
	Benzo(a)Pyrene	30.3	120	61
	Benzo(b)fluoranthene	49.8	110	61
	Benzo(k)fluoranthene	17.9	93	61
	Chrysene	29.3	--	61
	Dibenzo(a,h)Anthracer	3.8	25	61
	Fluoranthene	57.9	--	61
	Indeno(1,2,3-c,d)Pyren	12.0	67	61
	Naphthalene	2.9	--	61
	Pyrene	31.2	--	61
Metals	Copper	334.1	--	44
	Lead	420.3	10,700	60

Notes

mg/kg = milligrams per kilogram

RSL = Regional Screening Level

(1) USEPA Regional Screening Levels for Residential Soil. Summary Table (TR = 1E-06, HQ = 1). June 2015 (revised). Values based on residential exposure. Hazard quotient (HQ) of 0.1 accounts for potential cumulative effects on the same target organ. For compounds lacking an RSL, surrogates based on structural and/or toxicological similarities are identified.

(2) N.J.A.C 7:26E Technical Requirements for Remediation. Appendix D Historic Fill Database Summary Table. October 2011. Note that values presented are maximum concentrations.

(3) Roux Associates notes that on April 29, 2013, NJDEP updated its guidance on historic fill material to provide methods to confirm the presence of historic fill material and procedures to delineate such material, including a site specific investigation and historic fill study (NJDEP, "Historic Fill Material Technical Guidance," April 2013, Version 2.0. However, the NJDEP historically provided ranges of contaminant concentration in "typical historic fill material" (N.J.A.C. 7:26E N.J.A.C. 7:26E-4.6 Table 4-2). Ranges of typical fill material presented in Table 4-2 are discussed herein for illustrative purposes only, and do not constitute a site specific fill evaluation/determination as is required under current NJDEP regulations.

APPENDICES

APPENDIX A

Credentials of Dr. Neil M. Ram and Catherine Boston

The following provides information about the education, professional experience and technical expertise of Dr. Neil Ram and Catherine Boston who authored this report.

- **Neil M. Ram**, Ph.D., LSP, CHMM, is an Executive Vice President of Roux Associates in Woburn, Massachusetts. His practice focuses on assessment and cleanup of hazardous waste sites and litigation support. Dr. Ram received his B.S. and M.S. from Rutgers University and an M.S. and Ph.D. from Harvard University. Dr. Ram also completed Post Doctorate studies and research at the Technion University in Haifa, Israel. He has been an expert witness in a number of legal proceedings that involved allocating response action costs among responsible parties, estimating future costs of contaminated sites, compliance with the National Contingency Plan, environmental forensics (determining the source and time of chemical releases at hazardous waste sites), industry state-of-knowledge historical practices, and chemical fate and transport. A summary of Dr. Ram's testifying allocation experience (expert reports, deposition and trial) is provided in the table that follows.

Dr. Neil Ram's Cost Allocation Testifying Experience	
Project (chemical contaminant)	**Description**
Gowanus Canal, Brooklyn, NY	Prepared expert report on allocating remedial design costs to National Grid, the City of New York and other PRPs who owned or operated industrial facilities along the Gowanus Canal
Fox River, Green Bay, WI (polychlorinated biphenyls (PCBs))	Provided expert opinion about the equitable allocation assigned to Dredging Parties in the Fox River.
Kalamazoo River, Michigan (PCBs)	Evaluated total suspended loadings from about a dozen paper mills along the Kalamazoo River which was used by a second expert to calculate PCB loadings from these mills to the River.
New Bedford, MA (PCBs)	Developed an allocation between the City of New Bedford, and several entities that generated, transported or excavated PCBs from the City's high school and Middle School where PCBs had impacted site soils and wetland, in part from disposal of dredged PCB sediment from New Bedford Harbor.
Ashland Superfund Site including Chequamegon Bay, Ashland, WI (MGP tar)	Developed an apportionment for a former owner/operator of an MGP to assess and cleanup tar and PAH impacts on the upland and Bay portions of the Superfund site.
300+ contaminated sites nationwide associated with former Kerr-McGee Chemical Company (creosote and others)	Testified on costs to cleanup 300+ contaminated sites across the United States including apportionment to other potential responsible parties.

Dr. Neil Ram's Cost Allocation Testifying Experience	
Project (chemical contaminant)	**Description**
Rhode Island Resource Recovery Corporation, Johnston, RI	Apportionment of phenol loadings in leachate and condensate from landfill operations
Russell Field, Cambridge, MA (asbestos)	Evaluated potential pathways by which hazardous substances came to be located on Russell Field from activities conducted by various parties including W.R. Grace, the MBTA, SolidTek, the White/MK/Mergentime Joint Venture, Perini, Modern Continental and Sverdrup and assigned an equitable apportionment to the City of Cambridge.
Webster-Gulf Nuclear Site located in Webster, Harris County, Texas (radionuclides)	Determined apportionment of cleanup costs based upon radioactive isotopes associated with RPs.
Industrial Site, East Rutherford, NJ (metals)	Determined apportionment on abutting industrial Superfund site based upon potential mass loadings from historical wastewater discharges
Municipal Landfill, Maryland (MSW)	Evaluating apportionment of food manufacturing facility to the landfill relative to industrial clients.
Peterson/Puritan Superfund Site, Rhode Island (hazardous substances in MSW)	Determined types of hazardous substances potentially sent to the J.M. Mills Landfill (OU2 of the Peterson/Puritan Superfund Site) as a basis for apportioning costs among other PRPs.
Burlington Environmental Management Services (BEMS) landfill, NJ (Hazardous substances in MSW)	Revised allocation for municipal group to lower allocation assigned to dry and liquid municipal sludges
Shpack Landfill, Attleborough, MA (Hazardous substances in MSW)	Presented allocation to mediator as to why client should be assigned de minimis allocation for wastes transported to landfill.
Agriculture Street Landfill Superfund Site, New Orleans, LA (Hazardous substances in MSW)	Allocated liabilities between various parties that generated and transported waste to the landfill as well as historical operators
Mediator for Two Oil Companies, MD (Petroleum distillates)	Allocated liabilities for releases by two major oil companies at two service stations
NRD Allocation for Passaic River, NJ	Formulated apportionment approach for NRD claims associated with multiple party discharges to the Passaic and Saddle Rivers
Former Coal Tar Processing Facility, Island End River, Boston, MA (coal tar and CWG distillates)	Formulated allocation between current and former owners of historic tar processing facility
Mining Industry, Colorado (lead)	Supported mediation between two Arizona mining companies seeking to allocate costs for lead contamination.
Robertshaw Controls vs. Watts Regulator, NH (solvents)	Testified on allocating liability between current and former owner/operators

Dr. Neil Ram's Cost Allocation Testifying Experience	
Project (chemical contaminant)	**Description**
Village of Ridgewood, NJ vs. Shell Oil Company (petroleum distillate)	Provided apportionment opinions between three major oil companies for water treatment costs associated with gasoline-contaminated groundwater
USA vs. J. Lightman, (NJ) Hazardous substances in MSW	Testified on allocation amongst PRPs at two NJ Superfund Sites
Sherwin vs. Artra (MD) (solvent)	Testified on allocation between current and former site owners of paint manufacturing facility
Federal Insurance Co. vs. Purex Industries (NJ)	Testified on allocation of costs incurred vs. those necessary and appropriate
Anamet, Inc. vs. Shell Oil Co. (NJ) (Petroleum distillates)	Testified on allocation for multiple gasoline releases at service station
Fishbein Family Partnership vs. PPG (NJ) (chromium)	Testified on allocation between current and former owner/operator

- **Catherine Boston** is a Senior Geologist at Roux Associates in Woburn, Massachusetts. Ms. Boston received her B.S. in Geology from Colgate University and is currently a candidate for a Masters of Public Health degree at Boston University, with a concentration in Environmental Hazard Assessment. Ms. Boston provides technical assistance in support of environmental litigation. Her work in litigation support has included allocating response action costs among PRPs, estimating life cycle environmental clean-up costs, data compilation including analysis and interpretation, and compliance with the National Contingency Plan and State regulations. Ms. Boston has also assisted in environmental forensics evaluations including fate and transport of chemical contaminants, and has completed state of knowledge assessments regarding disposal practices. She has also provided expert testimony support in several allocation matters as summarized in the table which follows.

Catherine Boston's Cost Allocation Experience	
Project (chemical contaminant)	**Description**
Fox River, Green Bay, WI (PCBs)	Assisted in preparing expert opinion regarding the equitable allocation assigned to Dredging Parties in the Fox River.
Kalamazoo River, Michigan (PCBs)	Assisted in evaluation of total suspended loadings from about a dozen paper mills along the Kalamazoo River which was used by a second expert to calculate PCB loadings from these mills to the River.
Rhode Island Resource Recovery Corporation, Johnston, RI (Phenol)	Assisted in apportioning phenol loadings in leachate and condensate from a Rhode Island landfill operation.
300+ contaminated sites nationwide associated with former Kerr-McGee Chemical Company (creosote and others)	Assisted in developing costs to cleanup 300+ contaminated sites across the United States including apportionment to other potential responsible parties.

Neil M. Ram, Ph.D., LSP, CHMM

Executive Vice President – National Client Manager

Credentials:

Post Doctorate, Environmental Engineering, Technion Institute of Science, Haifa, Israel, 1980;

Ph.D., Environmental Engineering, Harvard University, Cambridge, MA, 1979

M.S., Environmental Engineering, Harvard University, Cambridge, MA, 1977

M.S., Environmental Science, Rutgers University, New Brunswick, NJ, 1975

B.S., Environmental Science, Rutgers University, New Brunswick, NJ (with honors), 1973.

Technical Specialties:

Contaminant fate and transport, environmental forensics, litigation support, Federal and State Superfund programs; environmental liability assessment, environmental chemistry, site assessment, risk assessment, Remedial Investigation Feasibility Studies (RI/FS), and remediation technology. Expertise in hydrogeology, water and corrosion chemistry and microbial ecology. Additional expertise in the screening, selection, design, implementation, operation and costing of remedial systems; selection and evaluation of sampling and analysis programs; data quality and data interpretation, environmental audits and water and wastewater treatment engineering. Projects have included Federal and State Superfund sites, large industrial sites, abandoned sites, mining operations, gasoline service stations, and former manufactured gas plant and coal tar processing sites. Expertise in compliance with the National Contingency Plan (NCP), cost recovery and cost allocation, fate and transport of chemical contaminants and engineering design of unit operations. Worked on hazardous waste sites contaminated with organic solvents, non-aqueous phase liquids (both light [LNAPL] and dense [DNAPL]), gasoline constituents (BTEX and MTBE), PCBs, chlorobenzenes, mercury, chromium, lead and other metals, and acidic and mixed waste in all environmental matrices. Designed and developed treatability studies, written guidance for EPA's RCRA program and has helped the Massachusetts Department of Environmental Protection develop new regulations under the Massachusetts Contingency Plan (the MCP) and the State's Underground Storage Tank (UST) reimbursement program (21J). Expert in drinking water programs and treatment systems including extensive work with water disinfection and carbon adsorption systems with particular focus on the formation and removal of trihalomethanes (THMs) and MTBE from water.

Experience Summary:

Over 25 years experience in environmental engineering, hazardous waste assessment, and remediation: Executive Vice President and National Client Manager of Roux Associates (1999 – present), General Manager, Gradient Corporation (a wholly-owned subsidiary of IT Corporation - 1999), Vice President and Manager of the New England District for Fluor Daniel GTI, Inc. (1991 – 1999), Senior Project Manager at ICF Kaiser Engineers (1989 – 1991), Senior Program Manager at Stone & Webster Engineering Corporation (1987 – 1989), Chemistry Division Manager at Alliance Technologies, Inc. (1984 – 1987), Assistant Professor of Civil Engineering at the University of Massachusetts at Amherst (1980 – 1984), and Post-Doctoral Research Fellow at the Technion Institute of Science (1979 – 1980).

Testifying Expert:

- Estimating Site Life-Cycle Closure Costs: Estimated life cycle site closure costs based on ASTM E2137-06 (Estimating Monetary Costs and Liabilities for Environmental Matters) and other industry guidance. Cases include both individual sites as well as large environmental portfolios of dozens to up to 3,000 sites nationwide. Cost estimates also based on real-world experience having assessed and closed dozens of hazardous waste sites impacted by organic, inorganic and radiological contaminants. Also evaluated the necessity, appropriateness and costs incurred by others including the USEPA.
- Compliance with the National Contingency Plan: Provided expert opinions about whether response actions have been in substantial compliance with the NCP in order to determine eligibility for cost recovery under the NCP. Reviewed technical reports and other documentation to determine their compliance with requirements and EPA and State response actions under the NCP in the following areas: (1) worker health and safety, (2) documentation of costs, (3) appropriateness of response, (4) site evaluation, (5) RI/FS, (6) Remedial Design/Remedial Action, and (7) Public information and community relations. Clients have included several industrial companies, major oil companies, a mining company, and a municipal sewerage authority. Projects have included sites contaminated with solvents, PCBs, petroleum, heavy metals and VOCs. Also evaluated areas where alternative technologies could have been employed to provide more cost effective cleanup. Managed several Remedial Investigation Feasibility Studies and Human Health Risk Evaluations at federal Superfund sites (see "Additional areas of technical expertise").
- Cost Allocation: Has allocated costs amongst potential responsible parties (PRPs) based upon equitable factors including toxicity, mass, distinguishability, degradability and facilitated transport of chemical contaminants. Has rendered opinions regarding the necessity and appropriateness of costs expended pursuant to the quality and type of data collected, response actions taken and adherence to pertinent federal and state environmental regulations. Authored feature article (2005) in the Journal of Environmental Science and Technology on cost allocation at hazardous waste sites.
- Remediation: Provided opinions on the selection, design, and implementation and associated costs of remediation systems to address soil and groundwater contamination using both state and federal technology selection criteria. Reviewed the design of municipal water supply wells and private water supply point-of-use treatment systems.
- RCRA/CERCLA: Provided opinions about the necessity and appropriateness of response actions being conducted at a Region I RCRA Corrective Action site. Also assisted a Technical Steering Committee at a Region III Superfund site which sought a technical impracticability waiver or ROD modification with potential dispute resolution process. Managed or assisted in overseeing Superfund Remedial Investigation/ Feasibility Studies and applications for Technical Impracticability, including the U.S. Titanium in Virginia (acidic wastes), MGM Brakes in Cloverdale, CA (PCBs), the Groveland NPL site in Groveland, MA (VOCs), the Picillo Farm NPL site in Picillo, RI (solvents and metals), Charles George landfill in Massachusetts (solvents and metals), the Morses Pond time critical removal action in Wellesley, MA

Neil M. Ram, Ph.D., LSP, CHMM

Executive Vice President – National Client Manager

(chromium), the Hows Corner NPL site in Maine (solvents), the Henderson Road NPL Site in Upper Merion Township, PA (VOCs) and the Union Chemical NPL site in Maine (solvents).

- Natural Resource Damage Claims: Retained by a paint manufacturer to formulate an allocation approach for funding an integrated multi-year study of the Lower Passaic River in connection with a Natural Resource Damages claim filed against about three dozen parties by the New Jersey Department of Environmental Protection for damage to this river. Designed an allocation based upon the available documentation and institutional knowledge about each parties' historical practices and discharge occurrences and the associated frequency and severity of these historical discharges. Also, retained as an expert witness on behalf of a chemical manufacturing company against a claim filed by the Department of Justice alleging fraudulent reporting of reasonably estimateable financial reserves for environmental liabilities. Provided opinions as to whether potential NRD claims should have been included in annual financial statements of this publicly-traded company.
- Hydrogeology/Chemical Fate and Transport: Expert opinions on timing of contaminant release using groundwater fate and transport models including simple advective flow models (Darcy's Law) to more complex computer models including MODFLOW and MT3D. Have rendered expert opinions on the timing, impact and exposure of contaminant releases based upon groundwater flow modeling, and on the adequacy of groundwater investigations. Also rendered opinions on various topics of hydrogeology including groundwater flow direction, specific capacity, groundwater velocity, plume configuration, plume type (stable, expanding or shrinking) and presence or absence of dense non aqueous phase liquids (DNAPL), and flow in fractured-rock systems. Have used both 2-D and 3-D visualization to present complex data in a logical and understandable manner.
- Environmental Chemistry (Environmental Forensics): Provided opinions regarding the timing of chemical releases using environmental forensic tools. Technical approaches have included chemical markers and additives, chemical component ratios, degradation analysis, chemical "fingerprinting," isotope analysis, groundwater modeling (time-of-travel) and factual information about historical site operations. Has opined about release dates of petroleum constituents at gasoline service stations, polychlorinated biphenyls (PCBs) and chlorinated solvents at industrial facilities, PAHs at former manufactured gas plant sites and fuel oil at industrial and residential properties. Also opined on data quality and validity of analytical methods and reported results. Has also opined about the causes of corrosion. Authored featured article (1999) in the Journal of Environmental Science and Technology on Environmental Forensics.
- Municipal Solid Waste and Landfills: Evaluated waste contribution from various parties at the Agriculture Street Landfill Superfund Site in New Orleans and at the Burlington Environmental Management Landfill in Cherry Hill, New Jersey. Provided expert opinions regarding historical operations at several municipal landfills and cost allocation among multiple parties that transported or disposed of wastes and operated at landfills. Also provided opinions on the source and impact of various landfill constituents on downgradient receptors. Provided testimony representing a new permitted municipal waste transfer facility during administrative hearings by the local Board of Health. Evaluated the source of arsenic downgradient from the town of Boxford municipal landfill. Also represented homeowner's located downgradient of the Town of Carver municipal landfill regarding alleged impacts to their property. Landfill sites have included: the Agriculture Street Landfill in New Orleans, LA; North Carver Landfill, MA; Charles George Landfill, MA; Municipal Waste Transfer Station, Abington, MA; the University of Maine Mixed Waste Landfill in Orno, ME, 68th Street Landfill, NJ; J.M. Mills Landfill, RI; Croton Point Landfill, NY; Shpack Landfill, Attleboro, MA; Boxford Landfill, MA; Picketville Road Landfill Superfund Site, Jacksonville, Florida and the Synagro Residual Management Co. biosolids facility, Claremont, VA.
- MTBE Migration and Treatment: Prepared expert reports and given courtroom testimony on the source, impact and treatment of MTBE for both private and public water supply systems. Have also modeled MTBE Subsurface transport to estimate release date(s). Reviewed MTBE treatment system design, treatment duration and costs. Conducted forensic analysis to distinguish MTBE gasoline formulations from pre-MTBE gasoline releases. Allocated costs between differential gasoline releases at service stations.
- UST systems: Formulated opinions regarding the cause for UST failures associated with various UST system components including tanks, product piping, dispenser drip pan and pumps, spill buckets, test boots, leak detectors and other system components. Knowledgeable about industry standard of care for testing and maintenance of UST systems.
- Stormwater flow: Provided opinions on the impacts of land development on surface water flow to downstream properties. Identified parameters effecting surface water runoff including: soil type, slope, cover, percent impervious cover, climate and season. Also described erosion mechanisms and storm water management to reduce erosion. Modeled surface water infiltration to groundwater and overland flow onto downstream property.
- Former Coke Manufacturing and Coal Tar Processing Site: Technical expert on allocating past and future costs between past owner/operators of the largest coke manufacturing facility in the United States. Used GIS to map historical site features and operating parameters to identify source, timing and pathways of chemical releases (mostly polyaromatic hydrocarbon (PAH) and metals) from past operations. Assessed relative production rates and changes in site operations to allocate responsibility. Evaluated contaminant distribution as a tool in determining source and timing.
- Alleged Fraudulent Conveyance during Bankruptcy: Formulated opinions as to whether future environmental reserves were reasonably estimable according to Generally Accepted Accounting Principles (GAAP) and industry guidance. Provided sworn deposition at deposition to support claim filed by the U.S. Department of Justice.
- Mining Sites: Formulated opinions regarding liability, damages, cost allocation, environmental compliance, and remediation costs for several large mining operations contaminated with hazardous constituents including the Libby Mine in Libby, MT; Pinal Creek Mines near Phoenix, AZ and Leadville mines in Leadville, CO.
- Mediator: Provided binding opinion in dispute between two major oil companies regarding cause of historical releases and associated cost allocation to each of the two parties.

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- Corrosion Failure: Provided expert opinions on the causes and timing of corrosion of USTs and other steel structures based on site-specific information and general industry knowledge about the causes of metal failure from corrosion. Taught graduate level courses on the environmental chemistry of corrosion.
- Fault Tree Analysis: Evaluated the cause of an explosion involving several fatalities at a chemical facility owned by Napp Technologies in Lodi, NJ. The explosion occurred as a result of an exothermic reaction in a pressure vessel caused by inadvertent water introduction. Dr. Ram identified the reaction mechanisms, the circumstances that likely caused the explosion and steps that could have been taken to prevent this from occurring. Also provided opinions about the cause of an explosion due to a pressurized drum containing petroleum sludge.

Additional Areas of Expertise and Experience:

- Massachusetts Hazardous Waste Sites: Dr. Ram is and has been the Licensed Site Profession (LSP) of record for both Tier I (high priority sites) and Tier II (lower priority sites) Disposal sites contaminated with petroleum, metals, VOCs, and semi volatile organics for both industrial and major oil customers. Sites include a former specialty gas manufacturer (metals), a former electroplating company (metals and VOCs), a former chemical manufacturing company (chlorobenzenes), gasoline service stations and other industrial sites (VOCs and metals). As LSP, Dr. Ram has overseen the assessment and cleanup of these sites as required under the Massachusetts Contingency Plan (the 'MCP').
- Risk Assessment: Managed risk assessments to evaluate the extent of contamination and its impact to human health and the environment. Primary editor for two books on the risks associated with drinking water contaminated with organic chemicals. Former manager of Envirologic Data, Inc.; and Gradient Corporation.
- Environmental Compliance Audits and Permitting: Conducted dozens of environmental compliance and liability audits at industrial facilities throughout the United States and in the United Kingdom to determine potential liabilities associated with site contamination and regulatory compliance. Regulatory compliance audits included air pollution control; water pollution control; hazardous waste management; solid waste management; underground storage tanks; materials, products and pesticide storage; PCB management; asbestos; past disposal practices; and occupational health and safety.
- Site Remediation, Engineering, and Design: Project Director for large number of industrial and UST sites to identify and implement remediation technologies to achieve desired cleanup goals. Remediation technologies have included: groundwater recovery and treatment, in-situ and ex-situ bioremediation, air and ozone sparging, soil vapor extraction (SVE), thermally enhanced, SVE, excavation with off-site treatment, recovery of Non Aqueous Phase Product (NAPL), steam injection, monitored natural attenuation (MNA), and oxidation technologies such as permanganate injection.
- Chemical Fate and Transport Modeling: Conducted analyses using a variety of industry-accepted models including MODFLOW, MT3D, VLEACH, and SESOIL. Determined plume migration and impacts, timing of plume arrival at receptors, and cleanup time frames based on calibrated input parameters.
- Water and Wastewater Engineering: Taught graduate courses on water and wastewater treatment unit operations. Conducted disinfection research projects for USEPA and the National Science Foundation. Conducted doctoral research on precursors to the formation of trihalomethanes (THM's). Also performed both algal assay and fish toxicity studies.
- Sampling and Analysis: Managed an environmental laboratory of over 20 chemists involved in the analysis of complex matrices for chemical contaminants. Designed sampling for assessing the nature and extent of site contamination in environmental matrices.
- Regulatory Support: Evaluated the Massachusetts Department of Environmental Protection's (DEP) waiver program under the MCP. Worked with the MADEP staff in establishing criteria for audit selection, identifying audit points in the MCP, and formulating audit activities. Assisted the MADEP in implementing several elements of the 1993 MCP. Assisted the MADEP and the Massachusetts Underground Storage Tank (UST) Board in writing regulations to implement the 21J UST reimbursement program.
- Training: Has given many short courses and seminars to both private sector and regulatory agency personnel on various environmental technical topics.

Publications:

Books

"Proposed Compliance Audit, Compliance Assistance and Enforcement Program for the Massachusetts Department of Environmental Protection, Bureau of Waste Site Cleanup Program," Chapter 39 in Hydrocarbon Contaminated Soils, Volume 3, Lewis Publishers, Inc., 1993 (co-authored with Anne Heffron and Brian Moran).

"Massachusetts Waiver Program Audit," Chapter 8 in Hydrocarbon Contaminated Soils, Volume II, Lewis Publishers Inc. 1992. (co-authored with Read, E., Mark Wert, and Sarah Weinstein).

"Significance and Treatment of Volatile Organic Compounds in Water Supplies," Lewis Publishers, Inc., ISBN-0-87371-123-8, 1990, (co-authored with R. Christman, and K. Cantor).

"Organic Carcinogens in Drinking Water: Detection, Treatment, and Risk Assessment," John Wiley & Sons, Inc., ISBN-471-80959-4. 1986, (co-authored with E. Calabrese and R.F. Christman).

Journal Publications and Proceedings

Ram, N.; C. Moore; and L. McTiernan, "Cleanup Options for Navajo Abandoned Uranium Mines," Journal of Remediation. Spring, 2016.

Ram, N.; J. Scott, K. Szymaszek; and D. Swanson, "Developing Life-Cycle Environmental Response Costs for Leaking Underground Storage Systems at Service Station Sites," Journal of Remediation, Autumn, 2014.

Ram, N.; W. Kwan; C. Gerbig and C. Moore, "Extricating Membership as a PRP at Hazardous Waste Disposal Sites," Journal of Remediation, Spring 2014, Volume 24, Number 2.

Ram, N.; L. McTiernan; and L. Kinney, "Estimating Remediation Costs at Contaminated Sites with Varying Amounts of Available Information;" Journal of Remediation, Autumn 2013, Volume 23, Number 4.

Ram, N.; Gann, G.; "Saving Money with Environmental Due Diligence," CryoGas International, June 2006.

Neil M. Ram, Ph.D., LSP, CHMM

Executive Vice President – National Client Manager

Ram, N. with Epler, N. and Wiest, M.; "Use of Graphics for Environmental Litigation Support: Examples from Real Cases," 2005 National Groundwater Association Ground Water and Environmental Law Conference, July 21-22, 2005; Baltimore, MD.

Ram, N., Wiest, M. and Davis C.; "Allocating Cleanup Costs at Hazardous Waste Sites," Journal of Environmental Science and Technology, March 2005.

Ram, N., "The Tools of Environmental Litigation Support: How Environmental Litigation Support Teams Employ a Unique Set of Skills and Tools to Improve the Outcome and Reduce the Cost of Legal Disputes," Environmental Forensics, 1, 25-30. 2000.

Ram, N.; Leahy, M; Carey, E.; and Cawley, J.; "The Environmental Sleuth: Technical Approaches and Forensic Tools Can Determine Historic Causes, Timing and Impacts of Site Contamination"; Environmental Science & Technology, November 1, 1999.

Ram, N.; "The Tools of Environmental Litigation Support: How Environmental Litigation Support Teams Employ a Unique Set of Skills and Tools to Improve the Outcome and Reduce the Cost of Legal Disputes"; International Journal of Environmental Forensics, 1 (1), March 1999.

"Variation in the Use of Risk Based Groundwater cleanup Levels at Petroleum Release sites in the United States," Human and Ecological Risk Assessment, August 1997, (co-authored with B. Hoskins, P. Patrick, J. M. Cawley, Jr.

Technology Effectiveness: A Response to Robert D. Fox, "Physical/Chemical Treatment of Organically Contaminated Soils and Sediments," Air and Waste Management, autumn 1996, (co-authored with W. Barber, D. Bass, R. Brown).

"*In-Situ* Sparging: Mass Transfer Mechanisms"; John Wiley and Sons, Inc., September 1996, (co-authored with W. Clayton, D. Bass, C. Nelson), Remediation.

Ram, N. *et al.*, "A Decision Framework for Selecting Remediation Technologies at Hydrocarbon-Contaminated Sites, Journal of Soil Contamination, 2(2): 167-189, 1993 (co-authored with D. Bass, R. Falotico, and M. Leahy).

Ram, N. "Response Strategies Can Reduce Compliance Costs for Soil, Groundwater Contamination Problems," Manufacturers' Mart, New England, April 1992. Vol 13 No. 4, page 15.

"Total Trihalomethane Formation During Targeted versus Conventional Chlorination of Seawater for Biofouling Control," Journal of Water Pollution Control Federation, September 1990, (co-authored with Yusaf Mussalli and Winston Chow).

"Preoxidant Effects on Organic Halide Formation and Removal of Organic Halide Precursors," Environmental Technical Letters, published by Science and Technology, England, Volume 9, pp. 1089-1104, 1988, (co-authored with J.K. Edzwald and J. Malley).

"Review of the Significance and Formation of Chlorinated N-Organic Compounds in Water Supplies Including Preliminary Studies on the Chlorination of Alanine, Tryptophan, Tyrosine, Cytosine, and Syringic Acid," Environment International, Vol. 11, 441-451. 1985.

"Validity of Chlorine Residual Monitoring in the Presence of N-Organic Compounds in Water Supplies," Journal of American Water Works Association, 76:9, 74-81. 1984, (co-authored with J.P. Malley, Jr.).

"Disinfection," Journal of Water Pollution Control Association, 76:9, 74-81. 1984, (co-authored with A. Venosa).

"Multiple Bioassays to Assess the Toxicity of a Sanitary Landfill Leachate," Archives of Environ. Contam. and Tox., 13:2, 197-206. 1984, (co-authored with S. Plotkin).

"Algal Assay Methods for Assessing the Impact of Wastewater Effluent on Receiving Waters," New England Water Pollution Control Journal, 17:1, 10-27. 1983.

"Predicting Algal Stimulatory Properties of Wastewater Effluent," Journal of Env. Eng. Div. ASCE, 109:5, 1099-1110. October, 1983, (co-authored with P. Austin).

"Selective Passage of Hydrophilic Nitrogenous Organic Materials Through Macroreticular Resins," Environmental Science and Technology, 16:3, 174-174. 1982, (co-authored with J.C. Morris).

"Microbial and Chemical Changes Occurring at the Mud-Water Interface in an Experimental Fish Pond," 33(3):71-76. Bamidgeh, Bulletin for Fish Culture in Israel. 1981, (co-authored with S. Utilizur and Y. Avnimelech).

"Microbial Changes Occurring at the Sediment-Water Interface in an Intensively Stocked and Fed Fish Pond," Aquaculture, 27, 63-72. 1982, (co-authored with O. Zur and Y. Avnimelech).

"Identification of Nitrogenous Organic Compounds in Aquatic Sources by Stopped-Flow Spectral Scanning Technique," Journal of Liquid Chromatography, 4(5), 791-811. 1981, (co-authored with J.C. Morris).

"Environmental Significance of Nitrogenous Organic Compounds in Aquatic Sources," Environment International, 4:5/6, 397-405. 1981, (co-authored with J.C. Morris).

"Nitrification in Four Acidic Streams in Southern New Jersey," Water Resources Investigations, pp 22-121. U.S. Geological Survey Publication. January 1978, (co-authored with J. Schornick).

Certifications:

Certified Hazardous Materials Manager, December 1991

Massachusetts Licensed Site Professional (License #6799)

30-Hour Total Quality Management & Quality Action Team Training, 1992 and 1993

40-Hour OSHA Training, 1989

8-Hour OSHA Supervisory Training, 1999

Annual OSHA Refresher Courses

Professional Affiliations and Activities:

Completed 16-hour training "Negotiating Environmental Agreements," Massachusetts Institute of Technology, December 1997
Editor, "TechnoFlash," Fluor Daniel GTI, Inc., 1991 – 1999
Licensed Site Professional Association, 1993 – present
Institute of Hazardous Materials Management, 1991 – present
Hazardous Materials Control Research Institute, 1987 – 2000
American Chemical Society, 1989 – present (Member # 00459672)
American Water Works Association, 2003 (Member # 00066314); Project Advisory Committee, VOC Off-Gas Control, 1987 – 1989
American Society of Civil Engineers (Member GRX10000010)
Standard Methods Committee (SMC), 17th Edition, 1987 – 2000
National Groundwater Association, (Member # 3128931)
Water Environment Federation, 1993 – present (Member # 01757759)

ROUX

Professional Profile

Catherine Boston
Senior Geologist/Risk Assessor

Technical Specialties

Ms. Boston provides technical assistance in support of environmental litigation. Her work in litigation support has included estimation of clean-up costs, data compilation including analysis and interpretation, and compliance with the National Contingency Plan. Miss Moore has also assisted in environmental forensics evaluations including fate and transport of chemical contaminants, and has completed state of knowledge assessments regarding disposal practices.

Ms. Boston also combines her background in geology with her human health risk assessment and data management skills to provide multi-disciplinary support to all aspects of remediation investigations. As part of a risk team, Ms. Moore has performed risk characterizations under the Massachusetts Contingency Plan (MCP), and using California Environmental Protection Agency (Cal-EPA) and Ohio Environmental Protection Agency (Ohio-EPA) methodologies.

Ms. Boston has also managed field activities including large subsurface investigations and characterizations, monitoring well installation, and multi-media sampling. Her work has included investigation and reporting under the MCP. Ms. Boston also is a trained and experienced wetland delineator using Massachusetts methodology.

Experience Summary

Senior Geologist, Roux Associates (August 2016-Present)
Project Geologist, Roux Associates (June 2014-August 2016)
Staff Geologist, Roux Associates (2011- June 2014)
Assistant Staff Geologist, Roux Associates (2009 – 2011)
Oyster farmer, Island Creek Oysters (2005-2009)

Credentials

Colgate University, Hamilton, New York
B.A. Geology, May 2009
Course Work: hydrology, geographic information systems, mineralogy, petrology, structural geology.

Boston University, Boston, Massachusetts
School of Public Health, 2016-2018
Masters of Public Health
Environmental Hazard Assessment

Health & Safety

OSHA 29 CFR 1910.120 40-Hour Safety Training
OSHA 29 CFR 1910.120(e) (8) 8-Hour Refresher Training
DOT 49 CFR Hazardous Materials Awareness, Modal and Function-Specific Training
MSHA Part 48 Surface Metal/Non Metal Mine Safety Training
Loss Prevention System (LPS) Trained
Smith System® Defensive Driving Course
American Red Cross CPR and First-Aid Training

Key Projects—Risk Assessment

- **Tank Car Facility, Ohio:** Lead risk assessor for a 160-acre tank car maintenance facility impacted with petroleum hydrocarbons, solvents, and metals. Managed an analytical dataset containing over 100,000 entries of soil, soil gas, indoor air, and groundwater samples. Prepared Risk Assessment Assumptions Document (RAAD) which included development of a conceptual site model for exposure scenarios, potential receptors and exposure parameters, toxicity factors and identification of chemicals of potential concern. Served as client liaison to the Ohio EPA. Following completion and finalization of the Remedial Investigation and Feasibility Study (RI/FS), will complete a Human Health Risk Assessment in early 2016 in accordance with the approved RAAD, and Ohio EPA guidance.
- **Synthetic Turf Exposure, California:** Performed data evaluation, and exposure assessment, a toxicity assessment, and risk characterization to evaluate potential child, adult and staff exposures to compounds detected in synthetic turf via incidental ingestion, dermal contact, and outdoor inhalation. Determined that the cumulative cancer risk and non-cancer hazard estimates for the most sensitive populations (facility staff, nursing mothers, and children users age 5-18) did not exceed the Cal-EPA target health goals of 1×10-6 and 1, respectively.
- **Surface Water Exposure, Philadelphia:** Performed data evaluation, and exposure assessment, a toxicity assessment, and risk characterization to evaluate potential child and adult residential and recreational exposures to surface water at six locations. Determined that the cumulative cancer risk and non-cancer hazard estimates, using the most conservative assumptions, did not exceed target health goals.
- **Former Metals Fabrication Facility, Massachusetts:** Assisted in the preparation of a risk characterization that included a hazard identification, exposure assessment, vapor intrusion to indoor air assessment using the Johnson & Ettinger model, and cumulative risk characterization.
- **Abandoned Uranium Mines, Navajo Nation:** Assisted in an evaluation of environmental hazards and human health risks posed by seventy abandoned uranium mines in Arizona. Compiled a GIS software database to assess potential exposure routes, and determine appropriate remediation measures.

Key Projects—Litigation

- **National Industrial Client:** Assisted in expert report preparation, and prepared expert witness for testimony at multi-billion dollar trial in Federal Bankruptcy Court. Assisted in estimating costs of legacy environmental liability that contributed to a historic $5.15B environmental settlement. Identified environmental legacy wood-treating, agricultural and chemical manufacturing, mining, waste disposal and petroleum sites based on ownership history and review of historical documentation. Evaluated sensitive receptors, contamination pathways and magnitude of environmental impact to develop metric cost estimating methodology for wood-treating, agricultural and chemical manufacturing, and petroleum sites. Assisted in estimating costs for Natural Resource Damages (NRD) for a portfolio of 20 sites with actual or potential NRD claims. Compiled, organized and summarized costing data for a portfolio of over 2,000 unique sites. Assisted in the preparation of a sensitivity analyses on estimated costs. Assisted in rebuttal of opposing expert report by interpreting and adjusting the opposing expert's cost estimate.
- **Evaluation of Twelve Historical Paper Mills, Michigan**: Performed an in-depth evaluation of the wastewater treatment systems of twelve paper mills over the span of 50-years in support of a total suspended solids (TSS) loading analysis. Compiled flow diagrams for twelve facilities illustrating operational changes and upgrades to each of the wastewater treatment systems, and compared against the historical standard of care and state of knowledge. Provided defensible estimates of TSS effluent from each of the twelve paper Mills, which another expert used to determine polychlorinated biphenyl (PCB) loadings to the river.

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- **Abandoned Uranium Mines, the Navajo Nation:** Prepared White Paper on cleanup options for abandoned Uranium mines on the Navajo Nation. Summarized the extent and status of surficial contamination arising from past uranium mining, and examined the options for addressing the risk that contamination poses to the people of the Navajo Nation.

- **Former Pesticide Manufacturing Facility, India:** Conducted a review of background contamination of Indian soils, nallas and groundwater. Evaluated other facilities surrounding the site, and identified constituents of concern potentially emanating from other sources. Demonstrated that elevated metal and pesticide concentrations surrounding the site were consistent with background concentrations, and not attributable to site conditions.

- **International Oil and Gas Exploration Client:** Queried client's internal database to compile data pertaining to major oil spill and impacts to shoreline, natural resources, and local industries. Evaluated fate and transport, weathering and fingerprinting of oil using chemical data analysis of product, sediment, water and shoreline samples.

- **Industrial Complex, New Jersey:** Complied historical data regarding tenancy, historical operations, chemical usage and standard of care to determine the nature and timing of a release at an industrial complex devastated by a fire. Completed a forensic evaluation to determine nature and timing of release of petroleum distillates via fingerprinting analysis. Assisted in trichloroethylene (TCE) time of travel calculations. Evaluated the necessity and reasonableness of past response costs, and apportioned past and future costs between multiple parties using GIS software to analyze response action costs in relation to specific site contaminants. Assisted in preparation of two rebuttal reports, preparation of an expert witness for deposition, and strategized and prepared line of questioning for opposing experts. Completed an evaluation of NRD claims and settlements for analogous sites in support of settlement negotiations.

- **National Electronic Manufacturing Client:** Evaluated the appropriateness of an analytical method of Ozone Depleting Compound detection via data compilation, analysis and summary.

- **NCP Compliance:** Reviewed technical reports and other documentation for a national electronics manufacturing facility, a wood-treating facility, a mining and chemical processing facility and at two nuclear processing facilities to determine their compliance with USEPA and State requirements for response and removal actions under the National Contingency Plan.

Key Projects—Field Activities

- **Subsurface Investigation at Sodium Aluminate Manufacturing Facility:** Managed a month-long Geoprobe® soil boring program to determine mass of product in the subsurface at a large active facility. Installed numerous monitoring wells using Hollow Stem Auger techniques, set isolation casing to prevent migration of contamination and advanced Groprobe Direct Imaging Electric Conductivity (EC) profiles to provide continuous logs of electrical conductivity with depth. Conducted continuous soil sampling and groundwater sampling.

- **Oversight of Subsurface Investigation and Gamma Surface Survey at Uranium Mine:** Oversaw a week long Geoprobe® soil boring program to delineate the lateral and vertical extent of environmental impacts associated with past mining activities at a site in the Navajo Nation. The investigation also included a GPS-based gamma count rate survey of surface soils to identify gamma-emitting radionuclide concentration anomalies.

- **Subsurface Investigation for a National Petroleum Client:** Managed and oversaw a week-long test pitting program in upstate New York to characterize the vertical and lateral extent of grossly-contaminated material at a commercial property to assist in the development of a remedial strategy. Investigation was conducted under NYSDEC oversight, in sub-zero temperatures.

- **Brownfields Project at Boston, MA Site:** Managed and oversaw a soil boring and soil characterization program. Assisted in developing an excavation plan to properly manage soils removed from the facility during redevelopment activities.

- **Phase I Investigation at Salvage Yard in Lawrence, MA:** Project manager for a Phase I environmental site investigation at a salvage yard in Lawrence, MA. Phase II activities are currently underway.

- **Aquifer Test for a National Chemical Manufacturing Client:** Managed field activities to determine the feasibility of using a specific aquifer to meet planned future facility needs. Oversaw the advancement and installation of a test well into the target aquifer using mud-rotary drilling techniques. Conducted a step-drawdown test to assess the well's connection with the aquifer, well efficiency, and the aquifer's ability to yield sufficient quantities of water for anticipated needs of the facility.

- **Additional Drilling Experience:** Conducted multiple additional subsurface investigations using Hollow Stem Auger, Drive and Wash, Mud-rotary and Geoprobe® soil boring techniques. Provided oversight of monitoring wells installation at various facilities.

- **Surface Water Monitoring:** Performs operation and maintenance of surface water monitoring equipment at Industri-Plex site in Woburn, Massachusetts. Assists in stormwater sampling and compositing activities.

Catherine Boston

Senior Geologist/Risk Assessor

Publications

Ram, N.; C. Moore; and L. McTiernan, "Cleanup Options for Navajo Abandoned Uranium Mines," Journal of Remediation. Spring, 2016.

Ram, N.; W. Kwan; C. Gerbig and C. Moore, "Extricating Membership as a PRP at Hazardous Waste Disposal Sites," Journal of Remediation, Spring 2014, Volume 24, Number 2.

Sullivan, D.G..; W. Kwan; C. Gerbig and C. Moore, "Proactive Evaluation of PRP Status at Hazardous Waste Disposal Sites," Environmental Claims Journal, June 18, 2015.